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sugar rather than starch. The author concludes that the excess of sugar causes the appearance of the anthocyan. This conclusion is based upon Overton's experiments. A third paper deals with the distribution of plants on a peculiar formation known as the "Polygonboden." In the last paper the author has collected some miscellaneous floristic notes.—H. N. WHITFORD.

### NOTES FOR STUDENTS.

R. KNUTH<sup>6</sup> has begun the publication of the results of his study of *Geranium*. After the general distribution of the genus is presented, each of the twelve sections is considered separately, the present paper including *Unguiculata* (5 spp.), *Subacaulia* (4 spp.), *Tuberosa* (4 spp.), and *Batrachia* (38 spp.).—J. M. C.

IN A PRELIMINARY PAPER<sup>7</sup> on chromosome reduction in *Larix leptolepis* Ishikawa announces a condition similar to that described in his paper on *Allium fistulosum*. In the prophase of the first division of the pollen mother cell twelve pairs of chromosomes appear. The chromosomes of the pair may be variously united, sometimes forming tetrads. In the second division twelve ring-shaped chromosomes are formed. The writer interprets the first division as an "equation division," and the second as a "reduction division" in Weissman's sense. The full paper will appear in *Jour. Coll. Sci. Tokyo*.—W. J. G. LAND.

J. M. GREENMAN<sup>8</sup> has published the general results of his long study of the North and Central American species of *Senecio*. After an historical account of the genus, the morphology of the different plant members is considered, and the classification presented. About 300 species are included, grouped into 22 sections, 14 of which bear Mr. Greenman's name. The subgenus *Eusenecio* O. Hoffm. includes 21 of the sections, and *Pseudogynoxis* Greenm. the remaining one. The species are merely listed under their tribes, 70 of them being unpublished new species. The geographical distribution of the genus as a whole and of each section is presented in concise and tabulated form.—J. M. C.

A NEW INTERPRETATION of the phenomena of sap pressure and bleeding has been set forth by Molisch.<sup>9</sup> He takes the position that all the cases

<sup>6</sup>Über die geographische Verbreitung und die Anpassungserscheinungen der Gattung *Geranium* im Verhältnis zu ihrer systematischen Gliederung. Engler's Bot. Jahrb. 32: 190-208. 1902.

<sup>7</sup>ISHIKAWA, C., Ueber die Chromosomenreduction bei *Larix leptolepis*. Beih. Bot. Centralb. 11: 6-7. 1901.

<sup>8</sup>Monographie der nord- und centralamerikanischen Arten der Gattung *Senecio*. Engler's Bot. Jahrb. 32: 1-33. 1902.

<sup>9</sup>MOLISCH, HANS, Ueber lokalen Blutungsdruck und seine Ursachen. Bot. Zeit. 60: 45-63. 1902.

of bleeding which have been observed are pathological phenomena, dependent either upon the stimulus of the wound by which the manometer was brought into the tissue, or upon the development of abnormal tissue (such as callus) covering the wound surface. The pressure arises, then, at or near the wound surface and not far back in the plant body. Many experiments were performed upon *Juglans regia*, *Betula alba*, etc., and all seem to support this idea. The work of Figdor, C. Kraus, Pitra, and Wieler is discussed, and evidence drawn therefrom in support of the new interpretation.—B. E. LIVINGSTON.

M. T. COOK<sup>10</sup> has published the results of a morphological study of *Castalia* (*Nymphaea*) *odorata* and *Nymphaea* (*Nuphar*) *advena*. The development of the megaspore and of the structures of the embryo sac is reported as presenting no new features. The first division of the definitive nucleus is followed by a wall across the embryo sac. In the upper chamber the endosperm develops, while the lower extends as an haustorial tube to the chalazal extremity of the ovule. The embryo is at first a spherical multicellular mass, as described by Lyon and Conard, and later forms what the author, in agreement with Lyon, regards as a single cotyledon. Following Lyon, he would regard this as justifying the transfer of the Nymphaeaceae to the monocotyledons.—J. M. C.

MISS SIBILLE O. FORD<sup>11</sup> has been studying the anatomy and development of *Ceratopteris thalictroides*. She finds that the plant is annual, and is often reproduced by adventitious buds originating in the angles between the lobes of the leaves. The bundles are generally bicollateral, and the cauline bundle system consists of an outer series of large strands and of smaller medullary strands. The developing stelar system does not pass through a siphonostelic phase as in most ferns with numerous vascular strands; but, like certain Nymphaeaceae, breaks up immediately and becomes polystelic. The sporangia are large, and have an imperfectly developed annulus. Miss Ford considers *Ceratopteris* to be closely allied to the Polypodiaceae, and also to show less marked affinities with the Marsiliaceae.—E. C. JEFFREY.

ROSENVINGE<sup>12</sup> contributes a paper on spiral position of leaves in several species of Polysiphonia. It is somewhat polemic, being directed against Seckt. His figures are meager for the immense amount of mechanics involved. He refutes Schwendener's contact theory, and makes clear the fact that the position of the leaf depends upon the position of the daughter

<sup>10</sup> Development of the embryo sac and embryo of *Castalia odorata* and *Nymphaea advena*. Bull. Torr. Bot. Club 29: 211-220. pls. 12-13. 1902.

<sup>11</sup> The anatomy of *Ceratopteris thalictroides* (L.), Annals of Botany 16: 95-121. pl. 6. 1902.

<sup>12</sup> ROSENVINGE, L. KOLDERUP, Ueber die Spiralstellungen der Rhodomelaceen. Jahrb. Wiss. Bot. 37: 338-364. pl. 6. 1902.

nucleus and the direction of the segment wall. The nucleus assumes such a position long before the wall appears. The leaf immediately below is rarely of sufficient length to reach the apical cell, as Schwendener assumes, and even when it does, stands out from the axis at a very appreciable angle. Even though there appears to be a correlation between the position of the lower leaf and the direction of the segment wall, we must look for some more hidden stimulus than mere physical contact.—JAMES J. WOLFE.

A. G. TANSLEY and MISS R. B. LULHAM<sup>13</sup> in a preliminary note describe a new type of fern stele in species of *Lindsaya* from the Malay peninsula and elsewhere. The tubular central cylinder has permanently a core of phloem only, and is of considerable interest because it presents in the adult a condition which is a developmental phase only in other siphonostelic ferns. In the same number of the *Annals* GWYNNE-VAUGHN<sup>14</sup> describes a curious axillary organ in *Helminthostachys zeylanica*. He suggests that the structure in question may be a vestigial axillary bud, or perhaps of glandular nature. T. G. HILL<sup>15</sup> makes a preliminary announcement of the discovery of a cambium in the fibrovascular strands of *Angiopteris evecta*. L. A. BOODLE<sup>16</sup> also describes lignification of the phloem in *Helianthus annuus*. Treatment of the sieve-tubes of old stems with phloroglucin and hydrochloric acid brings about the pink lignin reaction, not only in the walls but also in the contents of the tubes.—E. C. JEFFREY.

HUS<sup>17</sup> has published a systematic account of the species of *Porphyra* of our Pacific coast, with notes on structure and distribution. One is surprised to learn the great length of some of these plants, 325<sup>cm</sup> being recorded for a specimen of *P. perforata lanceolata*, and over three meters for *P. nereocystis*. There are two forms of attachment; the usual one discoid, and made up of rhizoidal filaments; and the second a cushion-like parenchymatous type. The latter is peculiar to *P. naiadum*, which occurs on *Phyllospadix* and *Zostera*, and results in certain interesting peculiarities of growth and structure. The cushion is at first a single layer of cells in thickness, and by marginal growth extends over the leaf surfaces of the eel grass. An indefinite number of fronds may develop from this cushion, any superficial cell having the power of growth. The cushion is therefore a preliminary phase

<sup>13</sup> On a new type of fern stele, and its probable phylogenetic relations. *Annals of Botany* 16: 157-164. 1902.

<sup>14</sup> On an unexplained point in the anatomy of *Helminthostachys zeylanica*. *Idem*. 170-173.

<sup>15</sup> On secondary thickening in *Angiopteris evecta*. *Idem*. 173-174.

<sup>16</sup> On lignification in the phloem of *Helianthus annuus*. *Idem*. 180-183.

<sup>17</sup> Hus, T., An account of the species of *Porphyra* found on the Pacific coast of North America. *Proc. Cal. Acad. Sci. Bot.* 2: 173-238. pls. 20-22. 1902.

of the *Porphyra* plant, analogous to the *Chantransia* condition of *Batrachospermum*. It is a very advantageous adaptation to insure the continuous production of numerous fronds. No new facts are presented respecting the problem of sexuality in this group, but the observations are rather against the statements of Berthold.—B. M. DAVIS.

IN A SECOND PAPER on the influence of tensions upon cell growth and the direction of new walls Kny<sup>18</sup> concludes that when no other factors are effective, growth takes place in the direction of a pull and at right angles to that of a compressing force. Cross walls seek a direction perpendicular to external pressure upon the dividing cell, but parallel to a stretching tension exerted upon it. There are "internal forces" at work in most living tissues, which tend to prevent this reaction to tensions, "heredity" being apparently the main one. This means, if we judge correctly, that the above principle does not nearly always hold true, but that the direction of growth and of wall-formation is mainly controlled by as yet unknown factors. Perhaps the most definite result of experimentation here recorded is one obtained, at the suggestion of the author, by M. Nordhausen on segmenting eggs of *Fucus*. Although the first walls in these eggs are normally formed at right angles to incident light, when the eggs are compressed between glass plates these walls always appear perpendicular to the plates, no matter if this direction be parallel to the incident light rays. Kny experimented upon roots of *Vicia*, *Malva*, *Raphanus*, tubers of *Ullucus*, and stems of *Impatiens*, *Begonia*, *Bryophyllum*, *Ampelopsis*, *Salix*, etc. Two plates showing the effect of tensions upon the different tissues accompany the paper.—B. E. LIVINGSTON.

DR. D. H. SCOTT<sup>19</sup> has recently published an account of some interesting fossil stems, chiefly from the Lower Carboniferous of Scotland. Although the specimens described have the *Dadoxylon* or *Araucarioxylon* type of secondary wood, they differ strikingly from other known stems of *Cordaite*s in the possession of mesarch bundles of primary xylem. The fossils are grouped under three genera, *Calamopitys*, *Pitys*, and *Dadoxylon*. *Calamopitys* is characterized by a small pith, surrounded by a few comparatively large mesarch primary wood bundles, and a thick zone of secondary wood. *Pitys* possesses a very large medulla and numerous mesarch primary strands, which are separated from the secondary wood by a broad interval of parenchyma. Of the third type of stem, *Dadoxylon Spenceri*, Dr. Scott writes: "The importance of *D. Spenceri* lies in its being on the one hand a typical *Dadoxylon*, with the type of secondary wood which we know belonged to *Cordaite*s, while

<sup>18</sup> KNY, L., Ueber den Einfluss von Zug und Druck auf die Richtung der Scheidewände in sich theilenden Pflanzenzellen (Zweite Mittheilung). Jahrb. Wiss. Bot. 37: 55-98. 1901.

<sup>19</sup> On the primary structure of certain Palaeozoic stems with the *Dadoxylon* type of wood. Trans. Roy. Soc. Edinburgh 40<sup>2</sup>: 331-365. *pls. 1-6*. 1902.

on the other hand it shows in a reduced form primary xylem comparable to that of *Lyginodendron* or *Poroxylon*. It suggests, perhaps more strongly than any of the other species described, a truly gymnospermous stem, which may well have belonged to one of the Cordaiteae, but which still retains the last relics of the primary wood-structure characteristic of the Poroxyleae and the *Lyginodendreae*." The article is illustrated by six plates, two of which are photographic.—E. C. JEFFREY.

L. A. BOODLE<sup>20</sup>, in the third of his studies on the anatomy of ferns, supplements the observations of Poirault on the *Gleicheniaceae* in several important respects. One species, *Gleichenia pectinata*, departs from the protostelic type of central cylinder described by Poirault for a number of other species of the genus in possessing a siphonostelic (solenostelic) cauline fibrovascular system. The stelar tube has internal as well as external phloem and endodermis. Boodle differs from Poirault in his morphological interpretation of the curious masses of brown sclerenchyma surrounded by an endodermis, which are often found embedded in the foliar traces of the *Gleicheniaceae*. Poirault regards them, even where not actually continuous with the similar very characteristic sclerenchyma of the cortex, as cortical sequestrations included by the stelar tissues. On the other hand, Boodle thinks, because the islands of brown sclerenchyma are sometimes continuous with similar cortical tissue and sometimes not, that no argument for their morphological nature can be drawn from continuity with the cortex or its absence. A complete description is given of the anatomy of the rare and interesting north Australian genus *Platyzoma*. The central cylinder is siphonostelic with an internal endodermis but no internal phloem. The foliar gaps in this monotypic and extremely xerophytic genus are much more reduced than is the case in the somewhat similar central cylinder of the *Osmundaceae*.—E. C. JEFFREY.

THE MUCH-NEEDED PROTHALLIUM of *Phylloglossum* has been obtained and studied by A. P. W. Thomas of Auckland, New Zealand. A preliminary account<sup>21</sup> has been published, but the detailed account, with drawings, is in hand for publication. Although adult plants were abundant, prothallia were very rare, being discovered in only three localities. It is suggested that one of the conditions lacking for the general and annual development of prothallia is the presence of the fungus symbiont that occurs always within the gametophyte. The prothallium is of the subterranean, tuberous type expected. At first an oval tuber is formed, from which arises a cylindrical

<sup>20</sup>Comparative anatomy of the *Hymenophyllaceae*, *Schizaeaceae*, and *Gleicheniaceae*. 3. On the anatomy of the *Gleicheniaceae*. *Annals of Botany* 15:703-747. *pls.* 38-39. 1901.

<sup>21</sup>THOMAS, A. P. W., Preliminary account of the prothallium of *Phylloglossum*. *Proc. Roy. Soc. London* 69:285-295. 1902.

shaft more or less elongated, dependent probably on the depth of the primary tuber. The top of the cylindrical body becomes expanded in various ways and bears the first sex-organs. Finally the whole structure becomes very irregular, and the whole upper part of the mature prothallium is green, excepting the conspicuous archegonial necks. The antheridia and archegonia seem to differ in no important particular from those of *Lycopodium*. The embryo, immediately on its escape from the prothallium, forms the protocorm, whose "pedicel" elongates and thrusts it to a safe depth (about 3<sup>mm</sup>). Crié's claim that he sowed the spores of *Phylloglossum* and obtained a colorless prothallium like that of *Ophioglossum* can only be explained on the hypothesis that he saw merely the primary tuberous portion of the prothallium, for the later and conspicuous part becomes even vividly green. On the whole, the prothallium resembles that of *Lycopodium cernuum* nearer than any other. Bower's observations of the occasional branching of the strobilus, and of a leaf some distance below the strobilus, are confirmed; but this leaf was always a sterile sporophyll, and no transition between protophyll and sporophyll was observed. Bertrand's claim that *Phylloglossum* is a reduction form on account of its semiaquatic habit is controverted by the fact that the plants grow better on a hilltop than on the slope, and Thomas never found them in an actual swamp. The writer inclines to the view of those who regard *Phylloglossum* the most primitive of living *Lycopodiales*.—J. M. C.

KARSTEN, in describing the embryology of the *Juglandaceae*,<sup>22</sup> emphasizes features in which this group resembles the gymnosperms, and expresses his belief that the angiosperms are derived from the gymnosperms, *Gnetum* being the point of contact. The forms studied were *Juglans regia*, *J. cordiformis*, *J. nigra*, *Pterocarya fraxinifolia*, *Carya amara*, and *C. tomentosa*. In *Juglans cordiformis* at the time of fertilization, and even later, the union of the carpels is delayed, thus leaving the ovules exposed, so that the condition hardly differs from that in those gymnosperms with orthotropous ovules, as *Gnetum*. There is an extensive sporogenous tissue in the nucellus, but any further development is usually restricted to a single cell in the median plane. The megaspore mother cell may develop directly into the embryo sac, or may first give rise to a row of three or four megaspores, the two upper of which never develop, but the two lower seem to have an equal chance. Many cases were found in which there were two embryo sacs in the median plane, lying one above the other, sometimes touching each other at the ends, but often separated by several layers of sterile cells. A case is figured in which the sac nearest the chalaza had been fertilized. In *Juglans nigra* the egg cannot be distinguished from the synergids before fertilization. There is probably no fusion of the polar nuclei, and if it takes place at all it occurs

<sup>22</sup> KARSTEN, GEO., Ueber die Entwicklung der weiblichen Blüten bei einigen *Juglandaceen*. *Flora* 90:316-333. *pl.* 12. 1902.

very late. Double fertilization was observed, and the writer believes that in all cases the union of the male nucleus with the polar nucleus takes place earlier than the fertilization of the egg. Although the occasional occurrence of ambisporangiate flowers may indicate a reduced rather than a primitive condition, the Juglandaceae are to be regarded as one of the lowest families of the angiosperms.

Professor Karsten's arguments for the derivation of angiosperms from gymnosperms are based upon embryological characters, and the most important points are well summed up in his diagrammatic comparison of the embryo-sacs of *Gnetum* and the angiosperms, as follows:

<i>Gnetum</i>		<i>Angiosperms.</i>
Prothallium in lower part	=	Antipodals.
Egg cells	=	Egg cell and synergids.
Endosperm nuclei	=	Polar nuclei.
The stimulus to development of embryo and endosperm by fertilization of at least two egg cells.	=	The stimulus to development of the embryo by fertilization of the egg, and development of endosperm by vegetative reproduction.

CHARLES J. CHAMBERLAIN.

ITEMS OF TAXONOMIC INTEREST are as follows: J. K. SMALL (Torreyia 2: 74. 1902) has described a new *Helianthus* from the sea beach of Florida.—F. S. EARLE (Bull. N. Y. Bot. Garden 2: 331-350. 1902) has published the first of a series of papers entitled "Mycological studies." It contains the announcement of the genus *Ascocorticium* in North America; a synopsis of the North American species of *Periconia*, 11 being recognized, 3 of which are new; and descriptions of 28 new fungi, *Hypodermopsis* (Hypodermataceae) and *Ohleriella* (Amphisphaeriaceae) being new genera.—R. S. WILLIAMS (*idem* 351-380. *pls.* 34-39) has published a preliminary list of Montana mosses, including new species of *Dicranum* and *Barbula*.—R. PILGER (Engler's Bot. Jahrb. 32: 53-55. 1902) has described a new African genus (*Acritochaete*) of grasses (Paniceae).—W. SCHMIDLE (*idem* 82) has described a new African genus (*Characiella*) of Protococcaceae.—A. ENGLER (*idem* 108-125) has described the following new African genera: *Lepidobotrys* and *Nectaropetalum* (Linaceae), *Pedaliophyton* (Pedaliaceae), and *Pistaciopsis* (Simarubaceae).—E. GILG (*idem* 139) has described a new African genus (*Dekindtia*) of Oleaceae.—V. S. WHITE (Bull. Torr. Bot. Club 29: 251-280. *pls.* 14-18. 1902) has published a revision of the Nidulariaceae of North America, *Cyathia* P. Br. (*Cyathus* Haller) containing thirteen species, one of which is new; *Crucibulura* Tul. with one species; *Nidula*, a new genus containing two species, one of them new; and *Granularia* Roth with three species, two of them new.—MARSHALL A. HOWE (*idem* 281-289) in "Notes on American Hepaticae," discusses *Cephalozia connivens*, *Telaranea*, *Arach-*



*niopsis*, and *Riccia Campbelliana*.—DAVID GRIFFITHS (*idem* 290–301) has described new western species of *Tilletia* (2), *Ustilago*, *Sorosporium* (2), *Gymnoconia*, *Puccinia* (3), *Æcidium* (2), and *Claviceps*.—ELMER D. MERRILL (Bull. 9, Bureau Plant Industry, Depart. Agric.) has published a revision of the North American species of *Spartina*, recognizing nine, one of which (*S. Bakeri* from Florida) is new.—C. R. ORCUTT (West Am. Sci. 12: 163–164. 1902) has described new species of *Mamillaria* (2) and *Echinocactus*.—A. P. MORGAN (Jour. Mycol. 8: 4. 1902) has described a new genus (*Acontium*) of fungi related to *Cephalosporium*, and containing three new species.—B. L. ROBINSON (*Rhodora* 4: 135–137. 1902) has described a new species of *Hypericum* (*H. Bissellii*) from Connecticut.—M. L. FERNALD (*diem* —) has described a new species of *Scutellaria* (*S. Churchilliana*) from Maine.—H. M. HALL (Univ. Calif. Publ. Bot. 1: 1–140 pls. 1–14. 1902) has described from the San Jacinto mountain new species of *Elymus*, *Stipa*, *Oxytheca*, *Potentilla* (2), and *Erigeron*.—J. M. C.

THE RUSTS OF CEREALS, especially the question of the transmission of the disease by means of the seed, is made the subject of a recent paper by Dr. J. Eriksson<sup>23</sup> in the first two issues of the *Annales des Sciences Naturelles* of the present year. The author reviews the sets of experiments made during the years 1892 to 1899 to grow wheat, oats, and barley in pots protected from atmospheric contagion by glazed cases of different designs, or by inserting the part above ground of single plants into stoppered glass tubes. In spite of the most careful protection rust appeared on the plants. The possible sources of this infection are discussed in detail, and by a process of exclusion the conclusion is reached that it came through the seed, and not from spores floating in the air, as generally assumed. In taking up the problem of the form in which the fungus hibernates in the seed, it is shown that the generally accepted view, that the mycelial life of the yellow rust (*Puccinia glumarum*) may extend throughout the winter and up to the following harvest time, is most likely an error. It is more probable that the rust which persists through the winter dies out in spring, and that both the yellow rust (*P. glumarum*) and the black rust (*P. graminis*) possess mycelium having about the same life period, and that the summer infection for both originates in essentially the same manner. Seeds from rusted plants, it is asserted, are capable of giving rise to rusted plants, with no external source of infection; and the author believes that the rust fungus exists in the seed in a mycoplasmic form, and may so exist as long as the seed is viable. Seeds sometimes bear sori filled with teleutospores, but it is not from these spores that the infection is derived.

While it is impossible to demonstrate the mycoplasm, the fungus for the

<sup>23</sup> Sur l'origine et la propagation de la rouille des céréales. Ann. Sci. Nat. Bot. VIII. 15: 1–160. pls. 1–5. 1902.

time having lost definite form and become intimately associated with the protoplasm of the host, yet many observations and experiments are arrayed by the author in proof of its existence. Moreover, certain analogous states have been observed in other organisms. Among the most striking instances are *Rozella* and *Woronina*, belonging to the *Chytridineæ*, and parasitic on *Saprolegnia*. According to the studies of Cornu and Fischer, when these plants penetrate the host they become diffused for a time in the protoplasm of the cell, and are then quite unrecognizable. Afterward they assume the usual form and produce spores. In accordance with this theory rust may be checked by treating the seed in a manner to kill the mycoplasm. A change of climate, conditions of growth, etc., may also cause the death of the mycoplasm, which will account for the fact that seed from rust-infested fields when taken to another locality or a distant country often gives plants free from that particular kind of rust.

In the third part of the paper the author discusses the various points raised by different writers who have expressed an opinion upon the subject. Only two American mycologists are mentioned, H. L. Bolley and M. A. Carleton. The paper closes with a bibliography of works cited, naming over forty authors and probably twice as many titles.—J. C. ARTHUR.